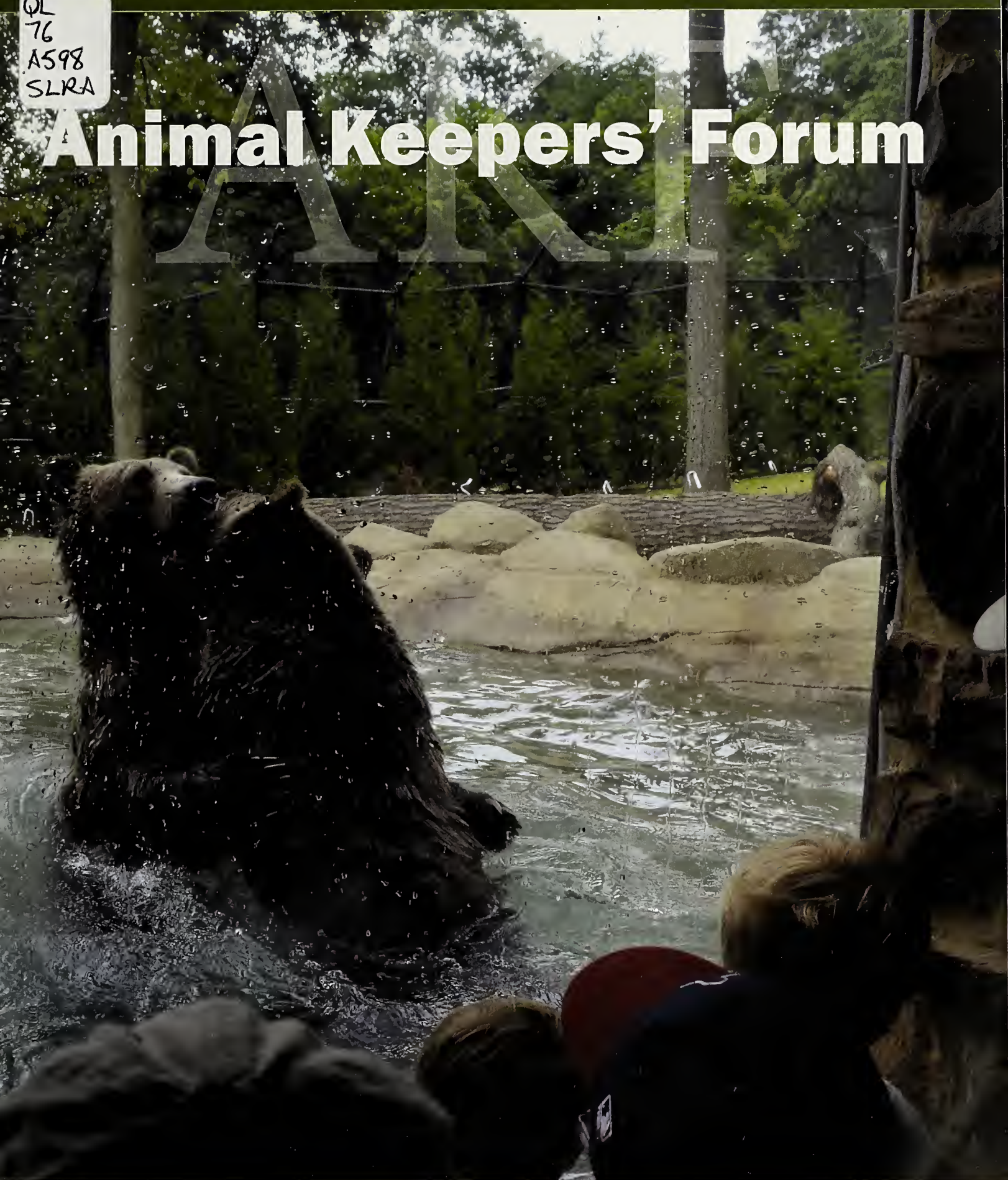


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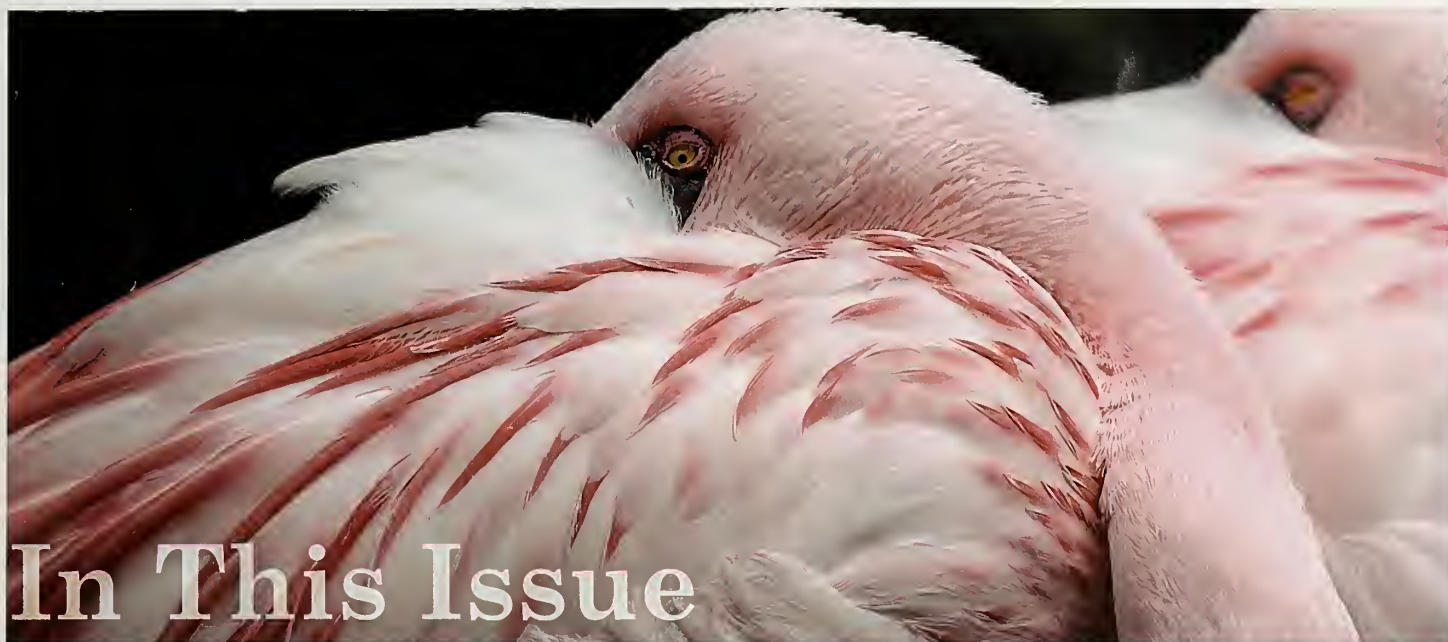
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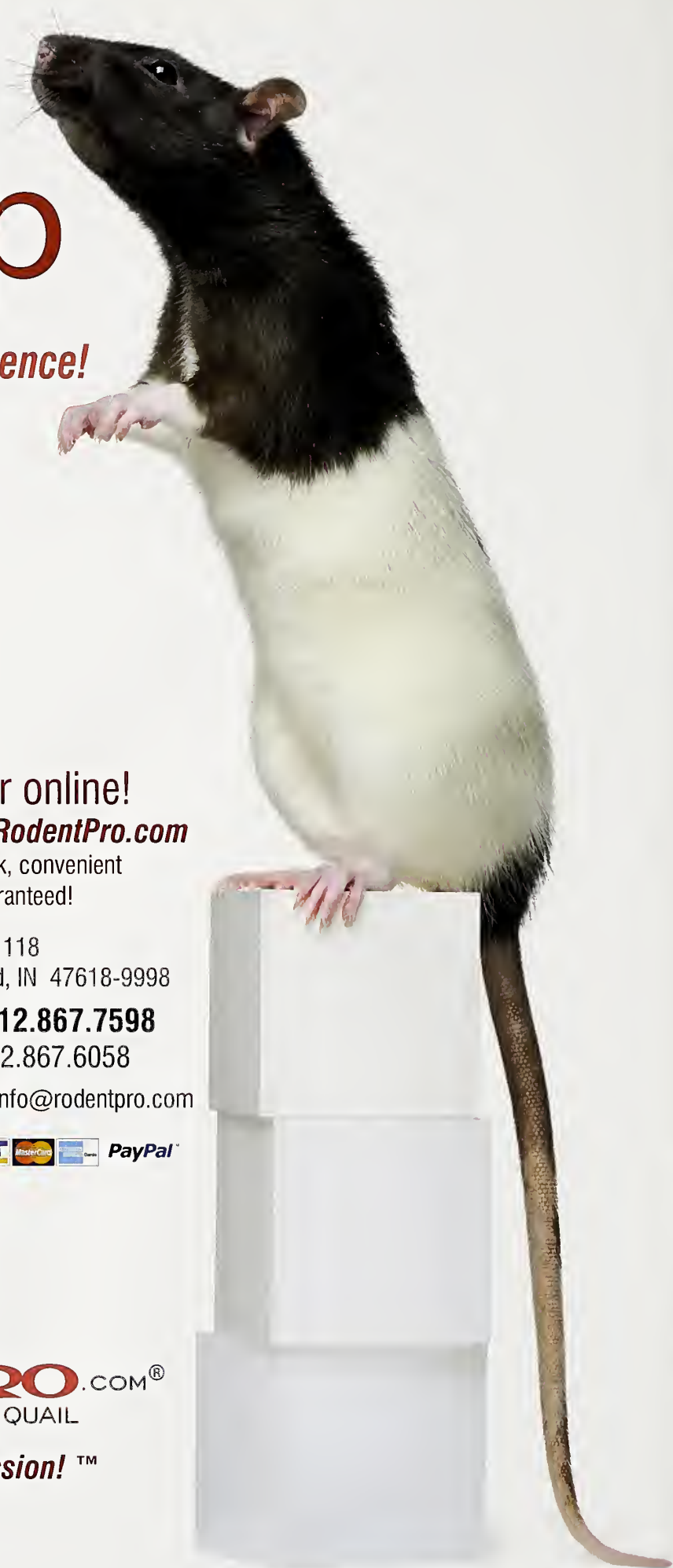
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American Association of Zoo Keepers, Inc.

The American Association of Zoo Keepers, Inc. exists to advance excellence in the animal keeping profession, foster effective communication beneficial to animal care, support deserving conservation projects, and promote the preservation of our natural resources and animal life.

About the Cover

This month's cover photo, by David Barnhardt of the Akron Zoo, features two grizzly bears (*Ursus arctos horribilis*) Jackson and Cheyenne at the Akron Zoo's *Mike and Mary Stark Grizzly Ridge* exhibit, which opened in July of 2013. The new exhibit allows visitors to get nose-to-nose with grizzly bears, river otters, red wolves, coyotes and bald eagles. The exhibit also includes a walk-in aviary featuring birds indigenous to Northeast Ohio. The entire exhibit space includes over four acres and was the Akron Zoo's largest expansion in their 61-year history. One of the features of the grizzly exhibit is a training wall that allows zoo visitors to get a close and personal view of behavioral training sessions with the bears and their keepers.

In this issue, our Training Tales editors present a paper by staff at the Tautphaus Park Zoo that describes just how important training can be when trying to perform ultrasounds on a pregnant sloth bear (*Melursus ursinus*). Gwen Harris of the Oregon Zoo describes the important roles that zoo keepers should have in animal exhibit design and Jacque Williamson of the Brandywine Zoo gives us a paper on how to use ethograms in a way to make us better educators. Tim McCaskie of Toronto Zoo describes how an AAZK grant helped support his work in conserving endangered fish in Madagascar, and the Tree Kangaroo SSP remembers the achievements of the late Larry Collins.

All of these contributions to this month's *AKF* highlight how multi-faceted the animal keeper profession has become. As National Zookeeper Week approaches in July, thank you for all that you do as keepers and as members of AAZK.

Articles sent to *Animal Keepers' Forum* will be reviewed by the editorial staff for publication. Articles of a research or technical nature will be submitted to one or more of the zoo professionals who serve as referees for *AKF*. No commitment is made to the author, but an effort will be made to publish articles as soon as possible. Lengthy articles may be separated into monthly installments at the discretion of the Editor. The Editor reserves the right to edit material without consultation unless approval is requested in writing by the author. Materials submitted will not be returned unless accompanied by a stamped, self-addressed, appropriately-sized envelope. Telephone, fax or e-mail contributions of late-breaking news or last-minute insertions are accepted as space allows. Phone (330) 483-1104; FAX (330) 483-1444; e-mail is shane.good@aazk.org. If you have questions about submission guidelines, please contact the Editor. Submission guidelines are also found at: aazk.org/akf-submission-guidelines/.

Deadline for each regular issue is the 3rd of the preceding month. Dedicated issues may have separate deadline dates and will be noted by the Editor.

Articles printed do not necessarily reflect the opinions of the *AKF* staff or the American Association of Zoo Keepers, Inc. Publication does not indicate endorsement by the Association.

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ANIMAL KEEPERS' FORUM

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Animal Keepers' Forum is published monthly by AAZK, Inc. Ten dollars of each membership fee goes toward the annual publication costs of *Animal Keepers' Forum*. Postage paid at Tucson, AZ.

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FROM THE PRESIDENT

What you get by achieving your goals is not as important as what you become by achieving your goals. — Henry David Thoreau

Milestones and Goals — Something remarkable happened in early April of this year. For the first time in the history of our Association, our membership peaked beyond **3000** members! For years, our membership maintained a steady fluctuation between 2600 and 2700; its ebb and flow consistent in range. Perhaps this new increase is the result of a healthy economy, though we have lived in healthier times. Personally, I tend to rest on the thought that there are a number of contributors which have affected our Association in such a positive manner. Indulge me please, while I elaborate.

Animal Keepers' Forum — Beginning in 1972 with an unofficial newsletter, "the Ruptured Rhino," AAZK has reached out to its membership providing articles on advances in animal care, conservation, and legislative updates. The first official AKF was produced two years later and for almost forty years, our membership enjoyed our small booklet publication in black and white. The AKF gained value as a resource tool for animal care personnel and thanks to the dedication of Susan Chan, it found its place of importance among keepers, managers, and curatorial staff.

Thanks to Shane Good, AAZK Media Production Editor and his staff, our current publication now boasts a modern look with richer colors and larger format. The covers are eye-catching brilliant photographs, no doubt adding to the professionalism of our publication. Dedicated issues are plotted in advance, providing excellent journalism on focused animal care.

BFR — Implemented as a national conservation fundraising program in 1990, Bowling For Rhinos has quickly become a major contributor to rhino conservation, providing support to the Lewa Wildlife Conservancy and International Rhino Foundation. In addition, BFR supports Action For Cheetahs in Kenya, helping to provide much needed support to these magnificent carnivores who share the same habitat in Kenya.

In 2011, AAZK established a goal of raising \$500,000 for BFR through its Chapter organized events. Led by Patty Pearthree, BFR Project Manager, AAZK Chapters came close to realizing this goal last year by raising over \$480,000, almost \$150,000 more than the previous year! Chapters, large and small alike are responsible for making this happen, proving a total effort of \$4.8 Million of funds raised since our program began! At some point this year, AAZK will surpass the \$5 Million mark in total funds raised!

Chapters — Over the past couple of years, I have noticed a strong leadership presence within Chapters. Officers are taking ownership of their Chapters and making decisions which benefit their Chapter membership. For example, several Chapters have chosen to underwrite the AAZK Online subscription costs for their members, providing both professional development and networking opportunities for their members. In addition, Chapters are exercising their voice with an increase in communication with National AAZK through listservs, AAZK Online, and individual phone chats. Their commitment begets strong leadership which then develops into Chapter ownership of this Association. That ownership strengthens the partnership with AAZK National.

CEO/CFO — When the Board of Directors created the position of Chief Executive Officer/ Chief Financial Officer (CEO/CFO), our goal was to combine the offices of Executive Director and Administrative Assistant when Barbara Manspeaker retired. The desired goal was to create a synergistic effect by which both combined offices would create greater efficiency in membership management and financial resources for AAZK. The results of a single oversight management system has had a very positive effect on how we do business. Ed Hansen has brought AAZK into the 21st Century, running the Association off of a business model, helping to improve our financial stability while improving our reputation as both a professional organization and conservation funding resource.

Committees and Conferences — Our commitment to the Association continued this year following the restructuring of our committees and conference structure back in 2013. Committees are now focused on four major elements: Education, Conservation, Communication, and Recognition. This commitment has carried over to our conference structure and on-line learning program. Look for more details as we unravel our plans for the combination of conferences, dedicated workshops and on-line learning as major components towards certification.

I am proud to be part of this Association; it's hard not to be proud. And it may not be any one reason why our membership has reached historical levels, but suffice it to say that we are working diligently to serve the needs of our membership. As a multi-faceted organization, we do great things on many levels. We set our goals high, determined to elevate animal care and our profession in the process.

At the end of the day however, it's not what we achieve but rather what we become.

As always, I welcome your thoughts and input. E-mail me at bob.cisneros@aazk.org, I would love to hear from you.

Bob Cisneros



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Orlando. For more information
go to: aza.org.

October 6-8, 2014

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laurie.conrad@SeaWorld.com.

October 8-11, 2014

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and conservation.



HOPE FOR POLAR BEARS AAZK Trees for You and Me CHALLENGE

Please join AAZK and PBI in celebrating the achievements of the Chapters participating in this year's Trees for You & Me Challenge--a friendly competition designed to raise funds for local tree planting projects!

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Here they are!

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Greater Philadelphia AAZK Chapter: \$1,110.00
Lincoln Park AAZK Chapter: \$1,195.00
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Columbus AAZK Chapter: \$500.00
Portland AAZK: \$445.00
Greater Baltimore Chapter: \$391.00
Birmingham Chapter of AAZK: \$340.00
Greater NJ AAZK Alliance: \$287.00
Puget Sound AAZK: \$64.00

Grand total:

\$6,692.45

Funds raised in the competition are used to support tree plantings or relevant greening efforts along with educational events where we hope you'll invite others to join you in additional conservation behaviors. You can coordinate your events with Acres for the Atmosphere or as part of an international tree planting effort through other conservation programs at your institution.

We appreciate your dedication to this conservation program, and we look forward to reviewing your reports about your local plantings by November 2014 on PBI's Save Our Sea Ice Community page.

SAVE THE DATE

for the next Trees For You & Me Challenge - starting October, 2014!

Thank you all for your support!
Christy Mazrimas-Ott
AAZK Trees for You & Me Chair

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Excitement Builds for the 41st National Conference of the American Association of Zoo Keepers in Orlando

This September, the **American Association of Zoo Keepers** will kick off an exciting week of learning, networking, professional development and FUN as hundreds of delegates from around North America converge on Orlando, Florida for AAZK's 41st National Conference. Attendees at last year's conference in North Carolina saw the continuation of a trend that was initiated a few years back, refocusing the week toward workshops led by subject matter experts. This shift has maximized the portion of each day that is dedicated to hands-on learning, while still allowing ample time for paper- and poster-based presentations of the latest keeper-led research.

The 2014 conference – kicking off on September 8 at Disney's Coronado Springs Resort – will see this format evolve a step further to include two tracks of in-depth themed instruction, one focusing on core keeper skills for folks newer to the profession, and another focused specifically on keepers in quarantine and hospital settings. Participants in each of these tracks will receive 12 hours of dedicated instruction from veteran keepers, and will return home equipped with the skills and confidence to excel in their daily duties.

Delegates not enrolled in either of these focused course tracks will be able to pick from dozens of interactive workshops covering a broad variety of topics, including administering an intern program, caring for neonatal birds, dealing with change in the workplace, marine mammal husbandry, veterinary pathology, and maintaining aquatic filtration systems – just to name a few. If there's a topic weighing on the minds of today's animal care professionals, there's a good chance it will be brought up by an expert and vigorously discussed by keepers hoping to take their colleagues' ideas back to their home zoos for possible implementation.

Of course, there will also be several hours dedicated to research presentations, giving keepers the opportunity to share what they've discovered through their own projects throughout the year. These various forums for sharing ideas are why AAZK's National Conference continues as the premier venue for zoo keeper training and professional development year after year.

But a National Conference isn't just about discussing great ideas... it's also about seeing great ideas in action! To that end, this year's Zoo Day will give delegates the chance to marvel at the beauty of Disney's Animal Kingdom, and will allow a first-hand look at how DAK keepers maintain their animals and their magnificent facility. Zoo Day is always the highlight of any AAZK conference, and the staff at Disney is sure to deliver one for the history books.

The **American Association of Zoo Keepers** is setting the pace for zoo keeper training and engagement throughout North America, and the 41st National Conference in Orlando will be the embodiment of years of hard work by a dedicated group of keepers hoping to maximize their colleagues' opportunities for professional growth. Their enthusiasm and vision is what AAZK is all about.

"These various forums for sharing ideas are why AAZK's National Conference continues as the premier venue for zoo keeper training and professional development year after year."



The 41st Annual AAZK National Conference

Orlando, Florida
September 8-12, 2014

“Keepers Making a
World of Difference”

Hosted by Disney's Animals,
Science and Environment
and the Greater Orlando
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Are you looking for someone to share a hotel room with during the conference?

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- Non-members: \$285.00 (includes all paper sessions, Icebreaker, Zoo Day, Awards Lunch, Banquet, T-shirt, Conference Packet and \$5.00 Carbon Offset Fee)

Our Pre-Conference Trip is going to Busch Gardens and is being hosted by the Tampa Bay AAZK Chapter.

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- Serengeti Safari

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Our Post-Conference Trip is an invitation to attend part or all of the AZA Conference. Perhaps you are interested in attending a TAG meeting?

Disney's Animal Kingdom, The Seas and SeaWorld Orlando are partnering with the Association of Zoos and Aquariums (AZA) and the International Marine Animal Trainers' Association (IMATA) to welcome AAZK attendees to the 2014 Annual Conference, September 12-18 at Disney's Coronado Springs. AAZK conference attendees are eligible to receive discounted registration rates*. To take advantage of this discount, AAZK members must first register for the AAZK conference and request the discount code to be used when registering for the AZA Annual Conference (<http://www.aza.org/annualconference>).

Early Bird Discounts include:

- \$375 full AZA/IMATA conference
- \$75-100 daily rate options depending on day (does not include social event tickets)
- SeaWorld Orlando Icebreaker tickets (priced separately; will be announced mid-April and can be purchased by contacting azameetings@aza.org)

*Please see conference website for more information

To register and for more information, please visit www.greaterorlandoazk.org
For questions, please contact us at aazk2014conference@yahoo.com

See You Real Soon!

Mexico Zoos Outreach Project

By Yvette Kemp, AAZK San Diego Chapter Liaison

I have always believed that keepers and fellow animal care professionals are a wealth of information. Throughout our careers, we've had the opportunity to work with a wide range of animals and have had many amazing experiences. We each become "knowledge authorities" of the animals we work with and many of us have worked with numerous animals. So one of my goals throughout my career has been to share what I have learned with others, as well as to learn from others in the field.

With that in mind, I started the Mexico Zoos Outreach Project. The project is an opportunity for U.S. keepers to share information about husbandry, exhibit design, enrichment, and program design and implementation. We all have a wealth of information and sometimes it is difficult to be able to share it. Participating in the Mexico Zoos Outreach Project gives animal care professionals a place to share their knowledge while being able to design and teach programs. They are also able to help design and propose policies that will benefit their facility. And this isn't just for animal care staff. This project invites everyone to participate: educators, nutritionists, construction staff, horticulturists, volunteers. Everyone who is involved in animal care have an important role that benefits animals in captivity and conservation. That's the beauty of animal people, no matter who or where they are, they want to share information and make animal care better. Reason: we all have the same goals – conservation, education, and animal care.

Actually, you can say I really started this project many years ago. Having grown up in Mexico, I know that there are differences in how animals are viewed and displayed at zoos. I compare several Mexican zoos I have visited to something like U.S. animal facilities some 15 years ago. The intentions are good, but the knowledge and teachings are a little behind. Since I go to Mexico on a regular basis, I take the time to visit the zoos in the area, meet with personnel there, and share whatever information I can. Information about husbandry, training, and enrichment tend to be the main topics and it is always exciting being able to teach and learn with the staff there. I have had the opportunity to assist at places like the three zoos in Mexico City (Chapultepec, Los Coyotes, and Aragon) as well as places closer to home like Parque Morelos in Tijuana. These "working vacations" are always gratifying and give me the chance to meet many people and learn new things.

Years ago I started attending conferences in Mexico. About four years ago I was invited to and attended a conference in Morelia, Michoacán, Mexico. A good friend of mine works at the local zoo and they were hosting the AZCARM Conference. AZCARM (Asociación de Zoológicos y Acuarios de México) is Mexico's equivalent to our AZA (Association of Zoos and Aquariums). It was during this conference that I met Fernando Gastelo, director of the Parque del Nino zoo located in Valle de Guadalupe just outside of Ensenada. We struck up a friendship and have been in contact ever since. Fernando had mentioned that they were building a zoo and had invited me to visit them. Parque del Nino is a new zoo, only 3 ½ years old, and Fernando is an architect by profession. Although the zoo's goal is to teach conservation to the children in the area, he admitted that his knowledge of the needs of

the animals was not his strength. His hope was that I could help him and his staff become a better zoo. Fernando and some of his staff had visited the San Diego Zoo several times, meeting with zoo and Safari Park staff, trying to learn about the best exhibit designs and animal needs. In 2010, bird department staff visited their facility to see the new flamingo exhibit they were building. Later, staff from the zoo and park visited again to discuss the possibility of working together on the pronghorn project.

In November of 2013, I led a group of 27 keepers and staff to Parque del Nino. Parque del Nino is not only a zoological institution with over 50 species, but a waterpark and recreation area. Many locals visit the park to spend the day, especially in the hot summer months. The day we went, we were able to get to know the staff and their facility. Even though our intention had been to work, their intention was for us to see the park and want to come back. It actually worked out for the best. It gave us the chance to see what the zoo's needs were and come back with a plan, because we did want to come back.

Our next trip in December was a three-day event and involved 15 keepers and staff. We arrived at the zoo on a Friday afternoon and devised a plan and goals for our working day on Saturday. The staff took us throughout the zoo and we discussed ideas as we went about. Early Saturday morning we hit the ground running: altering exhibits, making enrichment, and helping with husbandry needs. A big bonus was showing the staff how to perform hooftrims without having to anesthetize the animals each time. That was a long, hard day, as we worked from 7:00 am until around 4:00 pm. Sunday was a touch-up day, where some of us continued with some exhibit alterations while another part of the group continued with hooftrims.

Our last trip was a one-day event in February with 19 people participating. The goal for this trip was to assist the zoo staff as they continued with enrichment and help them with species natural history, the basis for all animal care and educational needs. We were also lucky to have two horticulturists join the group this time. They were able to help the zoo staff identify the plants on grounds and teach them about utilizing browse as part of the diet and enrichment.

The trips to Parque del Nino and other zoos are always enlightening and gratifying, but sometimes a little frustrating too. Regardless, they are always informative. We are able to share our knowledge and leave every time knowing that the animals and staff at that facility are better off than when we arrived. We are also able to learn what teaching methods work best and how better to communicate with others. And coming up with ideas that best fit each facility and finding ways to implement them is beneficial to everyone. Being able to learn how to work in teams and how to devise and implement plans is important in any field. Regardless of how much we love our jobs and the animals we work with, being able to communicate not only to fellow workers but the general public is key in making an impact on animal care and conservation.

The project is exciting and a great opportunity for me and those who join me. It is a learning experience and makes each of us involved have a greater understanding of the needs and requirements of all animals, their facilities, and how to best make those concepts come to life while working with others. I will continue to travel to Mexico and share information as best I can. Those interested are welcome to join me as long as they are willing to work hard, be open, are able to work with others, and have a passport. Spanish is not needed. Sometimes not knowing the language helps us make that extra effort to communicate our ideas and goals. Regardless, it is a fun and stimulating relationship where everyone benefits!



It is a learning experience and makes each of us involved have a greater understanding of the needs and requirements of all animals, their facilities, and how to best make those concepts come to life while working with others.



Building a Drain at the Lowest Point; the role of a zoo keeper during exhibit design and construction

Flamingos in exhibit after construction. Photo by Charlie Rutkowski

Gwen Harris, Senior Bird Keeper
Oregon Zoo
Portland, Oregon, United States

ABSTRACT

Zoo keepers act as animal advocates every day. They offer enrichment and training to keep the animals stimulated, alter their diets when necessary and contact the vets if something is amiss. Rarely do keepers get to be advocates on a very large scale, such as designing a new exhibit for the animals. Participating on an exhibit design and construction team may take time out of your days resulting in others picking up some of your work or calling in temporary keepers to help, but the opportunity to affect animal wellbeing on such a grand scale cannot be passed up. If the opportunity presents itself, keepers should know what to expect and the role they can and should play in the entire process. In general, having team members with various complementary backgrounds will be beneficial, resulting in innovating experiences for the visitors and excellent habitats for the animals. Having zoo keepers as members of an exhibit design team helps ensure the space will function well for the animals as well as the people that will be servicing it.

BACKGROUND

My first week working as Senior Bird Keeper at the Oregon Zoo, I was asked to be part of a construction design team to renovate the life support equipment in our aging penguinarium. It would have been preferable to knock the building down and start fresh. The building was constructed in the 1950's and originally housed Antarctic penguins *outside*; there have been multiple remodels piecing together a patchwork exhibit that now houses South American penguins *inside*. However, the life support renovation was already approved and funded by tax payers so we could not renege on what we had promised.

Onward I plunged into the exhibit design process. I learned how to read blueprints, investigated the many types of filtration systems and surveyed how other zoos manage their penguins' water quality. I learned the nuances and protocols for communicating with a construction team as well as how to make my relatively young voice heard in the large group of stakeholders. I pushed and pulled and bobbed and weaved my way through that first—and all too long—construction process; I came out on the other end more confident in my abilities and excited to be part of shaping exhibits for animals in the future. The reason I got into the business was to make life as good as possible for these amazing animal ambassadors we have in our zoos and aquariums. Helping shape the animals' immediate environment was an unexpected opportunity to ensure, and one hopes improve, our animals' welfare.

In my last three years at the Oregon Zoo, I have been part of an additional three exhibit design and construction teams and have learned something every time. During the flamingo exhibit design and construction, I learned how to insist on very specific features of the exhibit that were crucial for animal welfare; it is of the utmost importance that the substrate is right for flamingos or they can develop catastrophic foot problems. We had to have looked at two dozen potential substrates and we finally settled on one about three days before the installation date. The marsh (duck pond) exhibit taught me how to play my cards when someone else was in the driver's seat. I did not care for the waterfowl in question, but as senior bird keeper I was called in to speak on their behalf. And the condor exhibit has taught me about the importance of crafting a specific message for the guests to learn about and sticking to it, even if it is not the most popular message to tell.

I have forged partnerships with other departments in our organization and worked together as a team to have group buy-in on how the exhibit would be designed and how it would function for the animals, keepers and guests. My bird keepers revealed strengths and passions I would not have known about otherwise; one keeper put together a phone book-sized tome on flamingos, assembling countless photos of existing exhibits and husbandry information on the species. It was also gratifying and a bit entertaining to watch average-Joe construction guys morph into mini-experts on the animals for which they were building exhibits. There was one walkthrough for the penguinarium that sticks out in my mind. We were looking at a skimmer grate they installed when the foreman wanted to show me how he cut off any loose metal pieces and ground down all of the sharp points "so the penguins won't poke their eyes." I knew from that moment on that he got it; he understood the role of speaking for the animals and was on board with trying to make the best habitat for them.

BENEFITS OF KEEPER PARTICIPATION IN EXHIBIT DESIGN

From speaking with colleagues, I discovered that it was all too common to have exhibits constructed without any keeper-level design input. Intimate knowledge of the species, if not the individual animals, that will inhabit the facility is vital for an effective end result. Keepers can point out many things, such as the condors will be able to reach, and subsequently dismantle, the sprinklers so the plumbing should be relocated. They can offer ideas for built-in enrichment opportunities such as wallows for

pigs, exposed ground that lorikeets can dig burrows in, or buttons for elephants to push to open doors and let themselves back inside the building when they choose.

Besides having detailed knowledge of the individual animals, it is the keepers who will be working in the exhibits daily. They can reason through how servicing the exhibit will work and what will be necessary to make it function optimally. The pool drain should be placed at the lowest point. Keepers should have a clear view of each hydraulic door as they operate it from the control panel. Electrical outlets should be out of the animals' reach while still accessible to the shortest staff member.

Having a well designed exhibit that is safe and mentally stimulating can improve the physical and psychological wellbeing of the animals. Having an exhibit that can be effectively serviced and cleaned also safeguards the health of the animals and usually makes the cleaning go faster for the staff. Having less work can provide the keepers with more time to provide training and enrichment for the animals, which usually makes both the keepers and the animals happy! By involving zoo keepers in the exhibit design or renovation teams, zoos can help ensure the exhibit works well for both the animals and the staff.

Of course, exhibit design teams consist of more than just architects, animal keepers and construction personnel; there are many other stakeholders and team members as multidisciplinary participation in exhibit design is becoming more common in zoos and aquariums (Coe & Beattie 1998). Below is an example of what these multidisciplinary teams might look like for designing and constructing an exhibit (Fernandez & Varsik 2013):

Exhibits:

Animal Care-Keepers
Veterinary Support
Education/Conservation
Horticulture
Life Support
Facilities
Business Operations
Marketing/PR
Architects/Exhibit Designers
Visitor Studies
Animal Advocate

Interpretive Areas:

Education/Conservation
Interpretive Planners
Copy Writers
Graphic Artists
Industrial Designers
Visitor Studies
Animal Care



Oregon Zoo flamingo exhibit during renovation.
Photo by Doug Nelson

There are many beneficial reasons for this inclusive approach to assembling a team: to make sure all angles are covered, to gain support and buy-in from zoo departments, to pool valuable knowledge and experience and to help grow your staff's abilities (Coe 1999). Zoological organizations are recognizing these benefits and it is more commonplace to use these multidisciplinary teams in zoological settings, ranging from building exhibits to encouraging and developing seasonal staff and even financial initiatives (Coe & Beattie 1998). Most exhibit design projects involve multiples of the above stakeholders, but not always a member of the animal care staff. If you, as a zoo keeper, are asked to participate on one of these teams, there are many roles you can and should play in each of the design and construction phases. I will walk you through the process and discuss some crucial roles keepers can fill if invited to be on a design team

A KEEPER'S ROLE IN STAGES OF DESIGN AND CONSTRUCTION

The Conceptual Phase: The conceptual phase is when big picture questions are being asked and answered: what area of the zoo grounds are going to be used, what kind of animal(s) will we exhibit, roughly what will the habitat look like, will holding be needed, how will the visitors experience this exhibit, how much money will this cost? Keepers can suggest animals that fit in the theme of the area and ones that will thrive in the specific environment (shady vs. sunny, wet vs. dry, high vs. low traffic). They can speak to the amount of area needed for particular species as well as any peculiar needs they might have (hoofstock shift chutes, slopes out of water for flamingos, places to hide for duikers, nonabrasive flooring for penguins). They can help answer questions about costs of feeding and keeping the animals, as well as potentially find sources for acquiring the specimens.

Design Development: During design development (or DD) more precise 'ideal' drawings of what the exhibit will look like are drawn up, taking into consideration the scope of budget, location and time. This is the phase where you start to hone in on what the exhibit will look like. Keepers can help provide information like what kind of water feature the animal is most likely to use, how big the holding area(s) need to be, types of built-in enrichment opportunities that would be great for the animals, ways to maximize viewing opportunities for the public while keeping the animals from being too stressed, how high the mesh needs to be, types of appropriate substrate, the amount of space needed behind the scenes to store food, tools and enrichment and the amount of room needed for the inevitable behind-the-scenes tours. At the end of DD your documents should look like blueprints missing all of the details. In the next phase, you will fill in many specific details.

Construction Documents: During the construction documents (CD) phase the team develops very precise drawings of what will be built. Keepers can help work out many fine details during CD; it is important to be very specific and very thorough. Specify door hardware that the birds cannot perch on, put outlets in a safe location where the animals cannot access them, specify types of materials and plants that the animals cannot destroy and ingest, make sure the mesh is sized properly to prevent predators from entering the exhibit, keep the animals from escaping the exhibit and prevent them from getting an appendage stuck.

Bidding: The CD's are then used for the bidding process. If the bids come in under budget then construction can proceed. If bids are over-budget, then cuts may have to be made (Coe 1998). It is very valuable for keepers to be part of these discussions as they can speak to what features are most important for the animals as well as the function of the exhibit and which features are

expendable. The aviary might be able to go without the waterfall, but it needs the full spectrum lighting. Once those details are settled, it's time to break ground.

Construction: Keepers are not off the hook once construction starts. Perching trees may need to be placed in the field, finishes might need final approval, inevitably details are missing somewhere on the CD's, not to mention the need for quality control. Make sure those drains are at the lowest point and the doors are hung to open inward. Keepers' keen observation skills come in handy here for noticing those fine metal shavings or dropped screws that the penguins would inevitably ingest or the zebra might get stuck in its hoof. After the final clean up and testing of all of the new equipment, the animals (and keepers) move in. And that's the end, right? Wrong.


After Commissioning: Buildings need to be lived in and worked in for a while to get the feel of how things operate. Does one holding door being open block you from opening the second holding door? Is the bright yellow paint on the shift stalls too scary for the antelope? Did the ducks destroy the new sod before the exhibit even opened? Minor (or not-so-minor) modifications may need to be made after commissioning in order to have a successful exhibit (Coe 1998). Once all of the building's tweaks are worked out, then it's time to debrief about the construction process—what went well and what could be done better in the future?

As you can see, keepers can provide a lot of insight into the specific needs of the animals and staff that will be using an exhibit. During the design process, keepers can be updating their coworkers and asking them for additional ideas and comments. Each person brings their own talents, background and creativity to the table serving as another brain working out all of the kinks and coming up with innovative designs. Having them on an exhibit construction team is an invaluable asset. If you are invited to design an exhibit, be ready for some hard work, long meetings and rewarding results.

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Using Ethograms to Develop Research Skills in Students

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Teaching primary and secondary school students how to conduct their own research is a mainstay of curriculum standards for K-12 education. More and more, teachers are looking for ways to incorporate lessons that develop research skills while taking their classrooms outdoors into more 'natural' settings. Outdoor science lessons increase student confidence and learning while also helping students to positively experience and study nature (Carrier 2009, Cronin-Jones 2000). Ethology, the study of animal behavior, offers an excellent method to frame such outdoor science lessons: the ethogram. Ethograms are valuable tools for both behaviorists and educators, and are used to record types of behavior in individual, or groups of, animals, quantifying these behaviors for later analysis. Ethograms can be a valuable tool for educators or keeper/educators to take their programs outside and use guided inquiry to develop observation and research skills in young scientists, right on zoo or aquarium grounds.

WHY USE AN ETHOGRAM TO TEACH RESEARCH METHODS?

Students of any age can use an ethogram to observe and record behaviors, making this an ideal tool for all types of young researchers. Because ethograms involve a predetermined list of possible behaviors an animal may exhibit, student researchers can easily record, and later analyze, displayed behaviors on their own data sheets. Ethograms can also be tailored to age and skill levels; young students can work from a limited list of behaviors to develop their general observation skills, while older students can work from a more specific/detailed list, or develop their own behavior lists if time allows. Thorough ethogram use requires accuracy and attention to detail at any age, building student skill and knowledge for all participants. Regardless of student age, a well-designed ethogram data sheet will guide students in appropriately categorizing behaviors during their research. Additionally, introducing students to the concept of ethograms with a live program animal can be helpful by analyzing real

behaviors and recording them together. Finally, using existing ethograms that are actually used by zoo staff will make this experience more authentic for students and potentially save background planning as well as possibly contribute to active research at the zoo. This is also an activity many of us would have been eager to try as students ourselves!

HOW TO GUIDE OPEN INQUIRY

Determining what students want to study may be difficult, but with guidance effective projects can be carried out in small amounts of time. A brief description of a typical ethogram-based program may help outline tasks and goals as needed when designing your program (Table 1). Start by going on a 'Reconnaissance Mission' (see *Casual Sampling*, in Table 2) in the zoo to develop possible research questions with students. Have your group note the difference between *watching* and *observing*. *Watching* just requires looking at the animals, while *observing* involves analyzing what they're doing (Lehner 1998). Having students keep even a one-page 'field journal' for their research to jot notes in while developing their questions is helpful. Encourage them to take notes on things that may influence behaviors, like environmental features. There are many options for open-inquiry research questions in a zoo, so guide students to think about what animals they like and what they might be interested in finding out after completing their initial observations. Animals, like people, may exhibit preferences as individuals (Bowen and Arsenault 2008), so honing in on the underlying reasoning for those preferences, such as predator avoidance, environmental preferences, or access to resources, may narrow their interest into good research questions.

In any open-inquiry project, comparative questions are key. Strong comparisons are more 'solvable' and can be completed in shorter periods of time, whereas other types of questions, such as descriptive or essential, may be too complex or take too long to answer. For example, a descriptive question might ask, "Why

Table 1: The Ethogram Field Trip Format
A skeletal outline of a typical school ethogram program

Description	Details
Pre-Trip or Program Introduction	
1. Introduce students to comparative questions	1.1 Start with a pre-trip discussion in an outreach program, send materials to the teacher ahead of time, or cover in a lecture-style introduction.
2. Introduce program concepts	2.1 Define concepts such as inquiry, ethology, and ethograms, with examples.
During the Program	
1. Provide example behavior list	1.1 Provide, or have students develop, a behavior list including categories such as Maintenance, Locomotive, or Social. Help students properly and consistently identify behaviors to avoid confusion or duplication.
2. Reconnaissance expedition around zoo	2.1 Give students some reconnaissance time with the task of formulating their comparative questions.
3. Describe ethogram types	3.1 Explain different methods of ethogram sampling (Table 2)
4. Develop research questions	4.1 Develop comparative questions. Encourage focal sampling over group sampling, especially for younger students.
5. Allow time for sampling	5.1 Students should understand their time constraints and be allowed sampling time. 5.2 Encourage students to work in pairs for ease of data collection. One student can time while the other records.
Program Conclusion or Post-Trip	
1. Analyze results	1.1 Rough analysis of data can be made at the zoo, if time allows. Otherwise, finish analysis post-trip as a homework assignment, with their teacher, or in an outreach visit by zoo personnel. 1.2 Scale analysis to grade levels. Encourage visual depictions (graphs) of their data.
2. Present results	2.1 Have students present their results to their peers. 2.2 Encourage students to reflect on what they would change in future experiments as well as what they would keep.

Table 2: Ethogram Sampling Models
An overview of methods of data sampling for student ethograms

Method	Description
Casual Sampling	General notes are taken on what is happening, recording all behaviors over predetermined period of time. Pros: Allows students to just sit, observe, and record. Useful as a qualitative base to help determine a research question. Can be done individually. Cons: Not very systematic, not quantitative.
Scan Sampling	Specific behaviors are identified and at predetermined periods of time, say 15 or 30 seconds. At timed intervals, students will notate whether or not the animal is performing specific behaviors in a simple checklist. This is best done in pairs, with one student acting as a recorder and the other as the timer. Pros: An efficient way to grab a selected set of behaviors, especially for larger numbers of animals. Data are simple to record and analyze. For an even more quantitative version, Zero-One sampling can be used with this method. Cons: Only records specific subset of behaviors. Only records frequency, not duration.
Time Sampling	All behaviors performed are recorded during a predetermined period of time, say one minute. Again, this is best done in pairs. Pros: Works well when the study focus is small (one individual or a small group of animals). May record a wider variety of behaviors. Cons: Requires intense focus. Requires the ability to identify specific behaviors, and when they change.

do the marmosets eat on the higher branches?" whereas a comparative question might ask, "Do the marmosets spend more time feeding on high branches or on the ground?" As you can see, the comparative question will be much more straightforward to answer and analyze. The two most challenging features to the formation of any comparative question are: 1) making sure students' questions are 'solvable,' and 2) that students can isolate a single variable, or as few variables as possible. Having students work in pairs or groups may help them come up with appropriate research questions as well as work out the best methods of data collection and sampling. Finally, have students develop a hypothesis for their comparative question. Getting them to think about what they expect to find will help them to develop better research questions as well as more sound methods.

COLLECTING DATA AND ANALYZING RESULTS

Collection of behavioral data can be done in a number of ways, but the first thing to determine before your program begins is what type of sampling is appropriate for their age group. Three basic sampling models are proposed in Table 2, with different advantages and disadvantages discussed for each. Casual sampling is just that; students are given time to simply record what they see happening and practice their observation skills. Scan sampling will be most appropriate for younger or larger groups of students; everyone can participate, it can be done quickly, and data are easy to analyze. For even more quantitative scan sampling with advanced students, Zero-One sampling, where students record a 'zero' or a 'one' for every behavior, every sample interval, can be used. Time sampling may be more appropriate for smaller groups with more time to spend; this method may additionally be appropriate for multiple zoo visits. Very young students can simply draw and label, or, if an option, photograph different behaviors they may see occurring during or after a casual sampling instead of recording data in an ethogram chart.

Regardless of the sampling method selected, be sure to prepare your students for the inevitability of observing inactive animals, or the possibility of animals performing only one behavior for the entire duration of their observation. This is where good casual sampling 'reconnaissance' at the beginning of the program may prevent students from selecting an animal that they cannot continually view, or that may not be

**Inquiry-based education addresses multiple learning styles
and intrigues students of different intelligence levels.**

Observing Animal Behavior

photos courtesy of Ric Kotarsky, Tulsa Zoo



active at all observation times. Inevitably, students may need to reevaluate their comparative question after their causal sample or their first round of data collection. Just be sure to allow the opportunity for them to fine-tune their question in order to make it more suitable for their research project.

Depending on the age group, you will most likely conduct quite simple data analyses with your students. Counting displayed behaviors and plotting on a chart or graph can be done even with the youngest students. With very young students, if they all observe a group of the same species, their results can be combined together into a single graph written on the board-giving each student a chance to contribute to the overall project. Older students familiar with X-Y graphs and pie charts should be capable of documenting their findings, if given a sufficient example. For the most advanced students, statistical significance of specific hypotheses can be analyzed.

PROGRAM WRAP-UP

You may decide it makes more sense for the students to take time outside of the zoo to analyze their results, especially for older age groups. Prepare appropriate follow-up materials for the teacher, or for yourself if you plan on following up with students at their school later. Either way, program conclusion materials will help to guide students to a complete, well-rounded project. Be sure to ask reflective questions relating to their experiment as well as their process, such as 'Did your results support your hypothesis?' or 'What would you do differently next time?'. Though supported by national reform efforts and shown to positively affect student achievement (Lowery 2003), reflective teaching is all too often glossed over or skipped due to time constraints, so make this final component a celebrated book-end rather than an obligatory summary to your program. Furthermore, encourage constructive feedback from student peers to develop dynamic dialogue and introspective self-examination. If you have time during their visit to allow for data analysis, providing time for students or groups to present their findings is a fun, instructive, and memorable way to celebrate student findings and develop public speaking skills. Some teachers may prefer their students write a report as part of this project, so confer about whether you, or the teacher, will cover the basic tenets of scientific writing. Finish by asking students what they would next like to study, knowing now what they do

from their first behavioral experiment. This is not only an important component of a scientific report, but also a great way to keep them coming back to the zoo!

CONCLUSION

Using inquiry-based ethograms in your facility to enhance current programs or create entirely new ones is a great way to incorporate free-choice learning into your zoo environment. Inquiry-based education addresses multiple learning styles and intrigues students of different intelligence levels. By giving students and guests control over what they are studying, while at the same time connecting them to individual animals' behaviors, you take them beyond just watching and passively learning to actively observing, engaging, and participating. These all lead to long-term retention and possibly to improved environmental consciousness. The growing desire of zoos and aquariums to be recognized as centers for scientific learning can be met through strong inquiry-based educational programs such as this one. The great thing about ethograms is they can be done formally or informally, through a walk-by cart or a formal school tour, and they can be taught by zoo keepers, paid educators, or trained docents. Just think about the possible applications! If you're interested in learning more about inquiry-based education, check out Dragonfly's Q.U.E.S.T. inquiry-based education model (Myers et al. 1998).

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Training a Female Sloth Bear (*Melursus ursinus*) for Cooperative Ultrasound to Diagnose Pregnancy

Beth Rich – Zoo Superintendent, Joe Probert – Zoo Keeper, Alison Holderman-Salinas – Veterinary Technician, and Emily Lutz – Zoo Keeper
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Getting a pregnancy diagnosis in most bear species can be a little tricky. There's not a great deal of abdominal distension and delayed implantation can make calculating gestation rather difficult. Top it all off with possible pseudo-pregnancy where you can get all of the physical indicators of pregnancy, such as weight gain and mammary development, but then have no cubs; it's enough to make a zoo keeper pull their hair out.

When the Bear TAG had a population viability analysis conducted on the captive North American sloth bear population in 2012, the news was not good. There had been very low reproductive rates and without more breeding or importations, the current population was not deemed sustainable. So when we observed our 1.1 sloth bears, Mick and Pria, breeding in July of 2012 we were very pleased. We knew if we successfully raised cubs it would help bolster the captive North American sloth bear population.

We wanted to gather as much data as possible. We knew we could get weights on Pria and track her diet consumption and fecal output, but the threat of a pseudo-pregnancy hung over our heads. We were collecting fecal samples for hormone analysis but the staff wanted to do more. The keepers decided to train Pria to cooperatively participate in an abdominal ultrasound in hopes of getting a more accurate diagnosis of pregnancy. Keepers Joe Probert and Veterinary Technician Alison Holderman-Salinas were the primary trainers; Emily Lutz was a secondary trainer.

They knew that on the day of the ultrasound, there would be several people in the bear building, most of whom Pria was

familiar with, but to ensure she was comfortable and cooperative when hearing strangers, the staff set a radio on a timer and played National Public Radio on a low volume to help desensitize her to voices. Pria had regular exposure to various strangers in her day to day management during behind-the-scenes tours, classes and camps, so we felt confident she would be tolerant of new faces and voices in the building.

Then they set up a "station"; a four (4) inch x eight (8) inch opening was cut into the front of Pria's enclosure in the bear building that would allow access to her abdomen. When not in use, the panel was covered by a metal plate. The keepers also built a forearm sleeve that attached to the front of the enclosure. Pria was trained to sit with her belly up against the mesh (Figure 1) and reach one forearm into the sleeve (Figure 2). There was a metal rod inserted across the sleeve that she could grasp – this allowed her to pull herself forward and steady herself. Her cue to insert her forearm into the sleeve was "grab", and her cue was "hold" to get her to sit still. Staff then increased the duration of the "hold" to allow the process described. She progressed in "hold" time from 30 seconds to 5 minutes in approximately 14 days. Her release from the "hold" behavior was a verbal "OK, all done" followed by grapes or more of the peanut butter/honey treat.

An important safety note: This training was ALWAYS a two person procedure. One person manipulated the tools on Pria's abdomen and the other offered reinforcement. It was the responsibility of the person reinforcing Pria to communicate when to back off with the trainer using the tools. The importance of clear communication and trust between trainers CANNOT be emphasized enough.



Figure 1. Access to Pria's Belly. Photo Credit: Beth Rich

To desensitize Pria to getting her ultrasound, the keepers and vet tech worked in stages. Her reinforcements were peanut butter on a spoon or honey diluted with water in a squeeze bottle. They started by simply reaching through the opening in the mesh when Pria was holding in the correct position and touching her belly. As she became comfortable with this, they introduced the clippers. Initially, they put just the butt end of the clippers on her belly. Once she was fine with this, they clipped the hair on her belly. To desensitize her to the ultrasound probe, the trainers used the butt end of the casing from a sterile 60cc syringe. This approximated the size of the ultrasound probe and they could apply pressure to mimic the pressure of the actual procedure. They applied steady and strong pressure and would move the casing around on her belly to mimic the actual procedure. The keepers did not apply any alcohol or ultrasound

gel to her belly during the training process. They noted that she was not sensitive to their cold hands touching her shaved belly. However, Pria was introduced to alcohol on her paws during her blood draw training so the smell and sensation was not completely novel. Looking back on the process, the keepers said they would recommend introducing the gel prior to the actual day of the ultrasound procedure.

On Friday morning, November 23rd, Dr. Sara Herres from the local animal emergency clinic arrived with her portable ultrasound. Joe stationed Pria and directed the actions of the veterinarian. He was to advise her when to pull out of the enclosure if necessary. Ali reinforced Pria, and Emily handed Ali reinforcement as needed. To extend the duration of reinforcement, they froze the peanut butter onto spoons the day before. Pria sat calmly and cooperated beautifully! Dr. Herres started on the left side of Pria's abdomen. The probe was placed in the lower right and left quadrants of her abdomen, below her navel moving down to just above her hips. We were able to observe the spine, ribs and a heartbeat of at least one cub. Dr. Herres attempted to ultrasound the right side of the abdomen in a similar location and we thought we saw a second cub, but it was unclear if it was a second cub or just another view of the first one. For all of us, this was the first time doing an ultrasound on a bear and we were thrilled to have visual confirmation of at least one live fetus. However, the ultrasound machine was not set up to record the images so we planned to do a second ultrasound on the following Thursday, thereby allowing us to record the images, review them and try to estimate a size on the cubs.

On that following Thursday, November 29th, Joe came into the office for the morning meeting and said, "Well, you can cancel the ultrasound, we have two cubs." He had checked-in on Pria in the bear building before coming up and discovered our new arrivals. He said it appeared mom was holding them and he could hear them vocalizing.

Pria's training proved very valuable to managing her pregnancy and postpartum routine. We were able to shift her away from the den to perform quick exams on the cubs. She showed little to no signs of distress at being separated and when we reunited her with the cubs, she would calmly head back into the den. We all believe that the time and effort the keepers and vet tech took in Pria's training increased her trust and allowed us to get our hands on the cubs for regular evaluations.

Joe Probert said that the inspiration for this training came from all of the participants at the Bear Care Conference held in

Banff, Canada in 2011 – in particular, Jay Pratte and his bear training tales!

As a zoo superintendent, I could not be more proud of our team. They worked together to reach an important animal management goal and we have two healthy sloth bear cubs to show for their efforts! (Figure 3). 🐻

BHC comments by Jay Pratte:

It is always so enjoyable reading articles where a complex medical or husbandry behavior resulted in success. In this case, while the images were not recorded, they were able to successfully view the fetus via the ultrasound training. This is the type of training goal that can replace the historical immobilization process to do a work-up and ultrasound. An immobilization always carries some measure of risk, particularly when a pregnancy is involved. This process allows us to manage our animals in ways where we are able to attain a goal (ultrasound, blood draw, x-ray...) with the animal participating voluntarily. Stress levels are reduced, if not eliminated altogether, as the animals choose to participate in the process. When reinforced appropriately the end result is win-win, as we get medical results and the animal gets favored rewards!

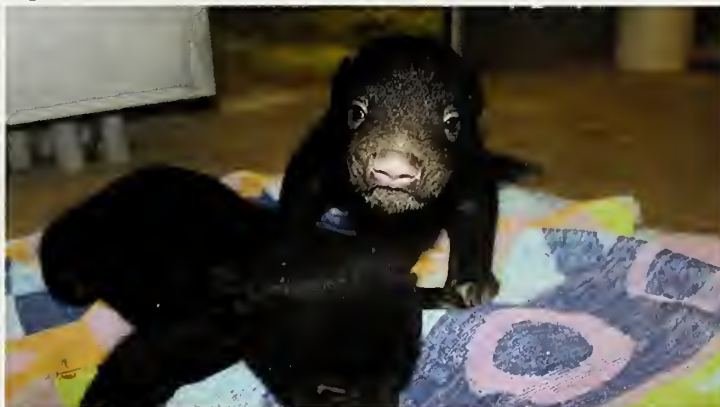
The process described also covers the various aspects that need to be considered; chaining behaviors together, improving hold durations, release cues, desensitization, etc. All of which, along with the importance of safety and effective communication, create a fluid learning process for the animals where a goal is reached successfully in a relatively short time. This ultrasound process is clearly well thought out and planned, and can easily be modified to work with other species as well (great apes, big cats...). Great work!

Thanks also for the shout out for the Bear Care Group and our efforts at helping improve bear husbandry. As an aside, the sleeve design pictured in this article also works exceptionally well for voluntary blood draw training with smaller bears. And I am guessing from the shaved foreleg in the photos, it has been used this way as well! So extra kudos for finding different uses for your training equipment! And as always, thanks for sharing your Training Tale.

Figure 2. Arm in Sleeve. Photo Credit: Beth Rich



Figure 3. 1.1 Sloth Bear Cubs, 6-Weeks-Old. Photo Credit: Beth Rich



MAD FISHES 2013

**Tim McCaskie, Wildlife Keeper
Toronto Zoo**

As a Wildlife Keeper at the Toronto Zoo I have a keen interest in the AZA Madagascar fishes SSP and the *in situ* work on this exotic island. My trip in October, 2013 is my third field study having worked with American colleagues Doctor Paul Loiselle from New York Aquarium, Alex Saunders from the Denver Zoo and our Malagasy partner Tsilavina Ravelomanana, a fisheries biologist from Antananarivo University. I had thought that I would not be going this year until I heard that the Zoological Society of London was looking for the critically endangered *Ptychochromis insolitus*. With grants from the American Association of Zoo Keepers (Local Chapter and AAZK National Grant), Durham Region Aquarium Society and The Endangered Species Reserve Fund at the Toronto Zoo all added to my fundraising events, I was on my way.

Someone added the Zoological Society of London post on the Madagascar endangered fishes Facebook page looking for a female *Ptychochromis insolitus*. That is when I called my colleagues in the Zoo world to see if anyone had seen any. The answer was NO. My next e-mail was to Tsilavina. Tsil has done fisheries research throughout Madagascar. If the fish exists, he would know the best

area to search. I found out that Tsil had looked for *Ptychochromis insolitus* twice before in vain. He suggested several locations that we should check. Tsil had contacted Guy, a Malagasy business man who owns ponds in Andapa. Guy made some calls and had some more leads on where to find the *Ptychochromis insolitus*. They both sent me budgets and I forwarded Brian Zimmerman's (curator of Aquariums at the Zoological Society of London) e-mail to them knowing he would be interested. Brian, Tsil, Guy and I worked out a plan to locate this critically endangered fish.

I met up with Brian and Kienan Parbles (an aquarist at ZSL) in London on our way to Madagascar. Brian had never been to Madagascar and Kienan had been there once before on vacation. They had no idea what they were in for. I can only describe conservation work in Madagascar as a training session. You are never totally prepared. You always have to overcome new obstacles and this trip would not be any different. We arrived in Antananarivo (Tana), the capital of Madagascar. After getting permits, maps and meeting several officials to get permission to fish, we went to the fish store to see what kind of invasive species we may find next in Madagascar. There were ID sharks (*Pangasianodon hypophthalmus*) which grow to four feet long and weigh about 100 pounds. On the plus side, I saw the same species there two years ago so either they are the same ones and are really stunted or they have sold the other 25 from 2011. They also had angelfish, dwarf gourami, and goldfish.

We stopped at Antkarafantsika National park on our way to Port Berge for the night. We were greeted by *Coquerels sifaka* in the trees just outside the parking lot. They were not afraid of people at all. We went on a night tour on the outside of the park since the park is off limits at night, and we saw mouse lemurs scurrying around the branches. In the morning I was awakened by chickens scratching just outside of my tent. I was happy to find out it was just chickens. Before we left the park we went across the road to see Lake Ravelobe. This is the last lake that is known to have *Paretroplus maculatus*. They are not permitted to fish in this lake due to it being a national park, yet there were children fishing despite the crocs in the water. We were very curious to see what they were catching but could not get close enough and we had a project to complete. Supposedly there are two more lakes inside the park. There may be *Paretroplus maculatus* in there.

We drove to Mandritsara, the biggest city in the Sofia region, to meet up with Guy and his team, comprised of Fidell and Norbert, the local fisherman. Before we leave Mandritsara we get permission from the mayor, local police, and a ministry official who joins us. We now have 10 people in our two vehicles with no air conditioning.

Brian Zimmerman researching the critically endangered *Ptychochromis insolitus*.





Coquerels sifaka

We arrive in our first village, passing areas of forest that has been recently destroyed and burnt down. The river is as wide as a football field, is long and half of it is sand. The river is fast, sandy and no more than two feet deep. We meet up with the Mayor to get permission to fish the area and camp. He says we can camp where we want and welcomes us to fish. We found that our cleanest spot to camp was on the sand where the river used to be. The other areas had zebu (Malagasy cattle) pooh everywhere.

Illegal fishing in Madagascar.



Because the river was so low we decided to go to our next location to fish and use this village for our home base. We drove for three hours, getting lost and the truck stuck in red sand but we made it to Ambodimanja. We spent the day here fishing in deep pools with seine nets to find no native cichlids. We did find *Sauvagella robusta*, *Awaous aenofuscus*, and a goby species that needs to be identified. As we were getting into our truck a girl runs up to us with a little *Pachypanchax* species that also needs to be identified. They were caught farther up the river in pools.



A plate full of *Pachypanchax* sp.

The next stop was back to Port Sofia. We were driving down what they call a dirt road. I think of it as more of a path. You can get a dirt bike down it or a zebu cart but a truck has a hard time. The clutch broke on the truck making us turn around to get it repaired. The people that we asked about “Jobemena” *Ptychochromis insolitus* on the way said that they do not have them in the river, but we will have to try again another day to know for sure.

After we got the car fixed we headed to the next village where a villager brought us a dried *Ptychochromis insolitus*. Our first thought was “ok at least they are here. Hopefully that was not the last one”. We get permission from the Mayor to stay and set up in a catholic missionary. To make sure we find the fish we split up into groups and send people out to six different locations. We fished about an hour away from the village in the river. Normally I am more than happy to jump into the water to fish but the water is brown and there are Nile crocodiles here so I thought I would watch from shore until needed. Using seine nets we caught the elusive “Jobemena” *Ptychochromis insolitus*. We were ecstatic to know that they are not extinct. At our first location we caught two *Awaous*, two *Sauvagella*, one *Pachypanchax* species and one Tilapia.

We head to our second site to find that villagers are using a plant to poison the fish. I was not able to find out the full effects of the poison on the fish but we were told we would not catch any



Ptychochromis insolitus - the first one that was brought to us

fish there that day so we moved on. We arrived at our second spot and caught another “Jobemena” *Ptychochromis insolitus*, five “Lamena” *Paretroplus nourissati*, three *Pachypanchax*, one goldfish and two Tilapia. We fished both sites for one hour.

The day after, we drove to the Reserve where we looked for “Jobemena” *Ptychochromis insolitus* and *Rheocles derami*. *Rheocles* are known to be found in forested areas with faster flowing water. The whole trip I had hoped to find this fish, being a rainbow species fan. As we walked through the reserve there were large beautiful trees, clean water and lemurs calling. This is what I had hoped Madagascar to look like when I first came in 2010. We walked up to the waterfall looking for fish when we crossed the streams but did not see any. The waterfall was beautiful and made the long hot hike worth it. It was cold, clean and wet. I went and stood under it as long as I could handle knowing the walk back was going to be twice as hot. As we got back to our car

Pristine rainforest in Madagascar



a villager brought us a *Pachypanchax* species dried up in a bowl. So we know there are fish there, at least *Pachypanchax*.

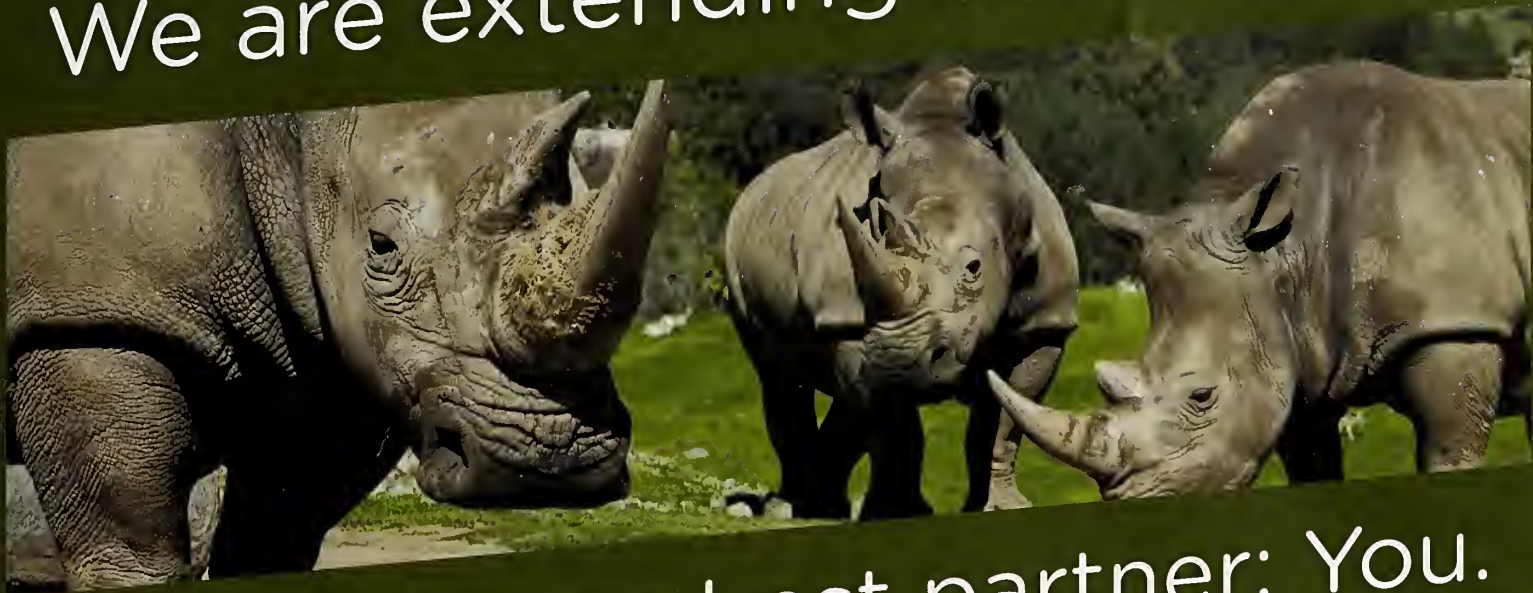
With the results of our first day of fishing in, we decided that our first two locations were the easiest to access and get fish out. Our objective was to bring 20 of each *Pachypanchax* species, “Jobemena” *Ptychochromis insolitus*, “Lamena” *Paretroplus nourissati*, and *Paretroplus gymnoperculatus* back to fish ponds to start a breeding program in Madagascar. With 20 we would make the breeding program viable for 100 years. We were aiming for fish two and a half inches or smaller. We decided we need to try and get all the species into a breeding program due to deforestation, poisoning and the large amount of rice fields around the river. We suspect being so close to the park reserve is the only reason there are still fish in the river. We started at 2 p.m. to reduce heat stress for the fish. We split into two groups and texted to each other every now and then so we knew how many of each fish we had in total. We used breather bags to transfer fish and used a mesh basket to make it easier to carry them. By the time we were done getting the numbers we needed we knew we were short but it was getting dark and we would have to use the numbers we had. When we got back to the missionary we did water changes on all the fish and put the cichlids into their own separate bag. The *Pachypanchax* were in one large breather bag. They are not nearly as aggressive. We managed to get 18 “Jobemena” *Ptychochromis insolitus*, 20 “Lamena” *Paretroplus nourissati*, 8 *Paretroplus gymnoperculatus*, and 15 *Pachypanchax* species into the ponds. While fishing we did catch one *Rheocles derami*. The villagers say they do catch them but there are not that many.

On our way back to Antananarivo we did fish a few more spots and take water quality parameters. The one spot we had hoped to find “Jobemena” *Ptychochromis insolitus* was in the mouth of the Sofia. It is brackish water and it is said that the Jobemena can handle it. When we got there we talked to the villagers who said they have not seen any of the fish we were looking for. When we got to the river we met a fisherman who confirmed that the fish does not exist in the head waters of the Sofia.

We have accomplished our goals this year by finding “Jobemena” *Ptychochromis insolitus* and securing a breeding population *in situ*. Our work is not done. If we are to truly save these fish we need to develop a plan to keep them in their habitat. To do this we need to work with the villagers around the river. We have a few options that we have thought of like building ponds to supplement their food sources, try to implement net size regulations to let the young grow up to breed, having a fishing season so they have a chance to breed, have designated areas where you do not fish, or trying to extend the natural reserve to include their habitat. These are a few of the options. We need to sit down and figure out which ones will work best for this area. This is just the beginning. 🐘

Tim's conservation project was supported by the AAZK CPR Grant. To learn how you can apply for AAZK grants, go to: <https://www.aazk.org/committee/grants-committee/>

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"Tree Kangaroos are above it all"



Tree Kangaroo Community Mourns the Loss of Larry Collins

Larry was born in Takoma Park, MD to S.R. and N.R. Collins. He graduated with a B.A. in Biology from Columbia Union College and a M.S. in Zoology from the University of Maryland. He was a certified teacher in the state of Maryland and taught science in the Montgomery County Public School System. Later he became a wildlife biologist with the Smithsonian Institution, first working at the National Zoo in Washington, D.C., and then transferring to the Smithsonian Conservation and Research Center (CRC) in Front Royal, VA, where he retired after 30 years of total service.

Larry was known in the zoo field as the go-to-guy regarding marsupials. His Master's thesis resulted in the 1973 publication of *Monotreme and Marsupials, a Reference for Zoological Institutions*. This was the must-have reference for anyone working with these animals. His interest in the Matschie's tree kangaroo resulted in years of behavioral and reproductive research at the CRC. He was instrumental in the eventual establishment of the Tree Kangaroo Species Survival Plan. Larry was a mentor for many Zoo Keepers and Students in the continued behavioral studies and reproductive research with Matschie's. His

work and support of others interested in expanding upon his work resulted in improved husbandry and reproductive success in tree kangaroos. He was always there to answer the tough questions and give encouragement when things didn't go exactly right.

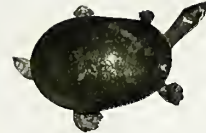
All that has been accomplished in the zoo profession with tree kangaroos, especially Matschie's, has his mark on it; in some way Larry was involved. He was pleased and proud that his work on tree kangaroo conservation extended into the wilds of the Huon Peninsula in Papua New Guinea with the establishment of the Tree Kangaroo Conservation Program.

None of it would have happened without Larry Collins. We will miss him dearly, yet his legacy will live on in all the work we do to conserve tree kangaroos. Lastly, Larry will fondly be remembered by his favorite phrase, "Tree Kangaroos are above it all".

Memorial by Judie Steenberg and Lisa Dabek



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